Ryegate Power Station Closure Contingency Plan & Remediation Report

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Reducing Economic Impact & Remediating Workforce, Forestry Industry & Forest Economic Impacts of Potential Plant Closure

In accordance with Act 39 (2021), the Secretary of the Agency of Commerce and Community Development, in consultation with the Commissioner of Forests, Parks, and Recreation submit the following report and contingency plan to address how to reduce any potential economic, workforce, forest industry and forest health impacts that may occur if the baseload renewable power plant (Ryegate Power Station) closes.

CONTENTS

Appendices/Supporting Resources

APPENDICES WILL BE AVAILABLE AND INTEGRATED INTO FINAL REPORT

- **APPENDIX A:** Harvesting Policy for Whole Tree Chipping and Roundwood Operations in Vermont
- **APPENDIX B:** Forest & wood Products Industries' Economic Contributions: Vermont, 2020
- **APPENIDX C:** Northeast Wood Markets Retention and New Market Recruitment Initiative: Sections III & IV: Forest Products Selection and Benchmarking, 2021

SUMMARY OF CONTINGENCY PLAN & FINDINGS

Executive Summary: To be completed for the final report.

CURRENT PLANT OPERATIONS AND REGIONAL ECONOMIC CONTRIBUTIONS

The Ryegate Power Station (Ryegate) produces electricity from the combustion of locally sourced whole tree wood chips and sawmill residues. The current owner, Stored Solar LLC, is a Maine-based company with assets across northern New England. In the past few years, the plant has averaged a production of approximately 160,000 Mega Watt hours (MWh) which represents 3% of Vermont's total electricity consumption. However, because Vermont imports more than half of the electricity that it consumes, the Ryegate plant represents a higher proportion (7.4%) of the electricity produced in the state. In addition to the sale of the electricity to Vermont electric distribution utilities, Ryegate receives payments for the Renewable Energy Credit attributes (RECs) of the electricity generation based on its production through a renewable resource. The electricity sales amount to $16.8 million and the RECs add another $5 million in revenues for the plant.

In addition to the purchase of fuel, the Ryegate plant employs on average, 20 workers and provides more than $1.8 million in compensation annually (wages plus benefits). Furthermore, the plant requires ancillary services such as utility purchases, insurance, and management support. These together with property taxes paid to the Town of Ryegate and Vermont's Education Property Tax represent another $4 million per year in economic activity.

The operation of the Ryegate plant requires about 240,000 tons of wood chips per year. Of this 240,000, a bit more than half (53% or 130,000 tons per year[1]) comes from Vermont forests. In an average year, Vermont logging contractors produce approximately 400,000 tons of wood chips per year and the two wood fired electricity plants (Ryegate and the McNeil plant in Burlington) consume the majority of this volume. As required by Ryegate's Certificate of Public Good (CPG), suppliers to the generating station must follow a harvesting policy approved by the Public Utilities Commission (Appendix A). These harvesting policies are

INTEGRATED HARVESTING

Because sustainable forestry focuses on improving the future forest, harvests often produce wood with a wide range of economic values, suitable for diverse markets. There is no such thing as a "low-grade harvest;" A logger optimizes the products possible within any harvested tree.

Although it generates little direct and immediate revenue for the landowner, harvesting wood with lower economic value is critical to achieving Vermont landowners' desired outcomes: growth of long-lived and more valuable forest products, enhanced wildlife habitat, forest health, recreational opportunities, carbon storage, resilience to climate change, and more. When less commercially desirable wood markets (fuelwood, pulp) are absent, these forest management goals are financially difficult or impossible to achieve.

[1] The wood chip values are an average over the 2018-2020 period and supplied by the Ryegate Power Station.

among the most the most stringent regulations required of any purchaser of forest products in Vermont and include pre-approval by the VT Fish & Wildlife Department after wildlife habitat assessment; periodic on-site inspections; strict adherence to practices to maintain water quality; protection of archeological sites; use of scientific silvicultural practices; limitations on size of clearcuts; and adherence to all applicable State & Federal laws. Failure to comply with the standards results in the plant not purchasing fuel from the operation.

The value of wood chips ranges from $20-$30 per ton delivered, paid to the supplier, and the Ryegate plant spends almost $8 million per year for the purchase of the fuel, again, a bit more than 50% going to Vermont logging contractors (about $4 million).

About 30-40 different logging contractors supply wood to Ryegate on a regular basis and another 10-15 on an infrequent basis. This includes operations which pile tops and have another contractor chip and truck the chips to the plant. Approximately two-thirds of these contractors are based in Vermont. Logging contractors in the delivery range of wood chip powered electric plants, such as Ryegate Power Station, have invested heavily in the past three decades in wood chip producing equipment that meets the expectations of landowners and foresters for harvesting systems to attain forest management goals and to supply local markets.

Wood chips are one of several products that result from the execution of sustainable forest management plans. Forest management results in products of high economic value such as saw logs, and products of lower economic value such as wood chips and firewood. Additionally, forest management works towards agreed upon goals such as wildlife habitat, biodiversity, forest health, water quality improvements, and timber management.

Wood chips specifically are derived from tree tops, limbs, and lower grade trees or portions of trees harvested as a part of forest management that benefits from the extraction of low grade timber in order to facilitate the growth of higher grade timber for dimensional lumber and other high value wood products which realizes a much higher value to landowners.

Wood chip production demands fully mechanized harvesting and processing of trees. Mechanized harvesting practices utilize equipment to fell, transport,

and process the trees from the safety of a machine and are far safer and more efficient at handling the high volume of lower value trees that are harvested to meet forest management objectives.

CURRENT FOREST INDUSTRY & FOREST HEALTH CONDITIONS

The purchase of low-grade material is a support for the entire wood products sector of the Vermont economy. The wood chip market for use in combustion (whole tree chips for electricity production and bole chips for direct thermal production, such as that used in many Vermont public schools and the State Capitol complex) are closely related to the wood pulp market where wood chips are used for the production of pulp for paper making. For example, in 2016, the demand for pulp wood decreased in Vermont and the resulting sales of wood chips for combustion expanded[2].

While the dollar value of timber used for wood chip production is lower on a per ton basis than sales for trees converted to lumber or other high value wood products, their sales help loggers' financial margin when harvesting forest land. The loss of pulpwood and wood chip markets in the region has created an oversupply of these products in the remaining markets which has resulted in a lower "mill delivered price" -- and in certain cases, no demand or market -- for these products. Logging contractors now must deliver some products farther for less revenue.

This puts downward pressure on the rest of the supply chain, including less available capital to reinvest in rural forest based businesses, less revenue to pay workers and implement best practices, and a lower payment to the forest landowner that supplied the chips. The number of loggers working Vermont's forests often declines when timber prices decline, providing evidence that increasing the margins for timber removal is critical to the long-term viability for the logging sector.

In addition to the economics supporting the removal of low-grade timber, the health of Vermont forests may be improved when some silvicultural removal takes place. One basis for this is related to the history of Vermont's forests. Almost all of Vermont forests represent regrowth following land clearing in the nineteenth century for farming. The progression from cleared land to a diverse mix of tree ages and species, along with high stand complexity from a range of tree sizes, conditions, and spacing, can be accelerated and enhanced with

[2] 2019 Vermont Forest Resource Harvest Summary

silviculture. This management often produces some trees that are then used to produce wood chips.

The Department of Forests, Parks, and Recreation (FPR) regularly monitors and reports on the health of Vermont forests and a part of that reporting is the measure of "Net Available Low-grade Wood Growth" (NALG), as reported in the 2010 and 2018 Vermont Wood Fuel Supply Studies. This value takes into account the fact that not all of Vermont forest land is available or appropriate for low-grade wood harvest. Even with those constraints, in its most recent report, Vermont continues to have almost one million tons of NALG and this figure is in addition to the low-grade wood currently harvested for wood chips, pulp and firewood.[3]

[3] 2018 Vermont Wood Fuel Supply Study

CONTINGENCY RECOMMENDATIONS

This report considers the scenario where the Ryegate plant is no longer in operation. There are three sets of economic activities that cease based upon the plant closure.

1. 160,000 MWh of baseload electricity is not generated.
2. 130,000 tons of wood chips are not purchased from Vermont sources (and 270,000 tons of wood chips are not purchased from the woodshed around the Ryegate plant).
3. $14 million of economic activity not related to the purchase of wood chips is not taking place.

1. Replacing the electricity

Vermont utilities obtain electricity from a combination of owned generation, long term contracts with in-state and out of state generators and short-term purchases from our northeastern regional market. One factor leading to the request for this report is that electricity can be purchased in the regional market for prices less than the current contract price for electricity from the Ryegate plant of $105 per Mwh. The Vermont Department of Public Service estimates that the market price of electricity averaged over the next ten years is approximately $70 per MWh. The difference between the market price and the contract price for electricity from the Ryegate plant is $35 per MWh meaning that Vermont utilities (and, by extension, Vermont rate payers) will pay about $5.6 million more for electricity per year if the Ryegate plant continues to operate under its current contract than if Vermont utilities purchase power from the regional market. It is this dollar figure that serves as the basis for considering the additional value of the Ryegate plant for its economic contributions to the area. The Department acknowledges that the electric market is volatile and there is the possibility of an increase in the market rate above the current calculated value, especially for electricity produced during low temperatures where the regional system relies on natural gas fired power plants that can face spikes in the price of their fuel. Any increase in the market rate of electricity decreases the extra costs faced by Vermont utilities and rate payers.

2. Replacing the market for wood chip production and its implications for forest health

130,000 tons of Vermont wood chips or 270,000 of wood chips in the woodshed surrounding the Ryegate plant is a significant proportion of overall low-grade wood harvested in the region. For Vermont, low-grade wood harvest material goes to four, only partly overlapping end use markets – whole tree wood chips for power generation, bole wood chips for heating, pulp for paper making, and unchipped logs for firewood. In its study of low-grade wood harvest volumes, FPR estimated that in 2018, the total volume of low-grade wood harvested was 1,750,000 tons. 900,000 tons was used as firewood, 500,000 tons used as pulp and the remaining 350,000 tons was chipped for use in electric generating and thermal plants.

It should be noted that the chips used at Ryegate are whole tree chips and are not an appropriate input for other woodchip applications such as heating and pellet manufacturing. This is due to the high bark content in the material. Additional processing, at additional cost, would be required to debark logs before chipping to be used for these applications. Top and limb material would not be able to be utilized, meaning that an expansion in pellet manufacturing and wood chip heating would not be able to absorb 100% of the whole tree chip material.

One set of contingencies is to consider the expansion of pulp, chip, and firewood markets to take the volumes available by a closure of the Ryegate plant.

The pulp wood market has been the subject of significant fluctuations as paper mills in northern New England close in response to changes in global demand for a variety of paper grades and products, among other regional and global forces. While newsprint and printing grade papers have seen sharp declines in demand due to the use of electronic media and communications, tissue and packaging grade demand has seen marked increases. Both New Hampshire and Maine continually pursue strategies for strengthening the economic viability of those mills, and it is hard to envision how Vermont can contribute meaningfully to influence paper mill viability.

The use of low-grade logs for firewood is a part of an entirely different -- but related -- market. Most firewood is harvested and distributed by very small-scale loggers and many only on a seasonal basis. This is in contrast to the wood pulp market that is dominated by very large mills, and it is for this reason that the pulp market is so much more volatile than the firewood market, but also determines the difficulty to design a policy intervention that influences firewood demand.

New Hampshire Case Study

New Hampshire faces a similar situation with regards to its wood chip fired electric plants. There are six plants in New Hampshire very similar to Ryegate with electric generating capacities of 15-25 MW. All except a plant in Bridgewater were closed by 2019 and the Ryegate owner (Stored Solar, LLC) has purchased four of them with the intent of re-starting. In 2021, the Springfield plant re-opened and is currently generating electricity. While the Ryegate-scaled plants were closing, there are two larger, newer plants in place in the Granite State. In 2006, Public Service of New Hampshire converted a 50MW boiler at the Schiller plant in Portsmouth to operate on wood chips and waste wood. The boiler had previously been a coal fired facility. In 2020, the entire plant closed down. In 2014, the Burgess plant opened in Berlin on the site of a formerly paper mill. The Burgess plant is a 75 MW generator and continues in operation today. In total, New Hampshire electricity production from wood fired plants has fluctuated and the closure of the Schiller plant led to the low point in generation in 2020. With the decrease in generation from wood chip fired plants, the regional market

for low-grade wood has also been stressed. The *New Hampshire Bulletin* produced an article that tells the story of the New Hampshire low-grade wood market during the summer of 2021.[4]

Growing the demand for low-grade wood by increasing the amount of advanced wood heat is a policy supported through work of the Clean Energy Development Fund.[5] Vermont has a goal in its Comprehensive Energy Plan of meeting 35% of its thermal energy needs from advance wood heat by 2030. If that goal were to be met, it would replace or add another 900,000 green tons of local market demand for low grade wood.[6]

There are other uses of low-grade wood that go beyond pulp, chips for power generation, and firewood. Vermont currently has one operating wood pellet mill that uses approximately 45,000 tons of white pine each year for the production of ultra-premium pellets under the name of Vermont Wood Pellet. There are interests in pursuing options for starting other pellet mills in Vermont that could take some of the available low-grade wood for that purpose. However, Vermont scale wood pellet mills are not simple to start up and maintain. Another pellet mill in Springfield, Vermont had to shutter in 2018 after finding it difficult to maintain financial viability. While there is additional capacity at pellet mills in New Hampshire should demand for pellets increase enough to bring additional shifts online, they would not accept whole tree chips and additional processing would be necessary.

There are potential options under consideration for the use of woody fiber as a feedstock for the production of chemicals and bulk material currently made with fossil fuels. While promising as possibilities, there is yet to be a production-scale operation in place in the region. These technologies include:

- Pyrolysis Oil - mostly used as industrial/commercial heating fuel. Highly acidic and requires heating system modifications.
- Green Diesel - has promise but likely would need changes to Federal Renewable Fuel standard to be competitive.
- Wood Fiber Insulation - unclear if whole tree chips would be a suitable feedstock. A wood fiber insulation plant is currently under construction in Central Maine but is not yet in production.
- Biochar - small but potentially profitable market producing filtration product. Large potential market for soil amendments, but may be cost prohibitive for agricultural uses.

[4] https://newhampshirebulletin.com/2021/06/07/foresters-loggers-grapple-with-loss-of-markets-for-low-grade-wood/
[5] The Clean Energy Development Fund currently has a proposal to support the replacement of older wood chip heating plants in Vermont's public schools.
[6] http://www.revermont.org/wp-content/uploads/FINAL-2030-Wood-Heat-Road-Map.pdf

Smaller market opportunities exist in mulch production and composting with manure, food scraps, and sewer sludge. Other replacement markets are limited.

When considering the general topic of expanding markets for low grade wood, Vermont is not alone. Maine has a much larger wood products industry and faces the same challenges for maintaining the demand of low-grade wood. Maine has sponsored several years of analysis into the options for using greater volumes of forest products as part of its' FORMaine process; Vermont is fortunate to have access to that research[7]. Unfortunately, there is no obvious solution resulting from that research at this point and the development of new markets for wood products will require continuous attention and partnerships with the business interests in Vermont and elsewhere that can sponsor any new product development.

Should the Ryegate Power Station close without an alternative market, the investments logging contractors have made will be devalued and they will lose equity in their equipment. In addition, contractors would need to retool their operations with mechanized equipment that delimbs trees in the forest to eliminate the need for hauling limbs and treetops in two directions. This equipment retooling can cost from $100,000-$1.5 million depending on the equipment setup and is only compatible on specific terrain and tree types.

Another set of contingencies could consider mechanisms that support pre- and non-commercial management and restorative practices such as payment for ecosystem services. This set of strategies would manage and foster habitat, biodiversity, carbon storage and sequestration, resilience, recreation, and other benefits as appropriate.

While a direct replacement for the material currently going to Ryegate may not be readily available, it is of utmost importance that Vermont find other outlets for local production utilizing local resources.

3. Replacing the non-wood chip economic activity

The 20 jobs at Ryegate, associated compensation, and additional ancillary economic activities associated with the plant can be replaced by other economic activities, but those are not likely to be at the plant site. When considering the specifics for replacing the Ryegate mill, one set of options is to consider an alternate use of the plant property and its machinery and equipment. Unfortunately, wood chip fired electric plants are closing across the region and there is no obvious replacement activity being identified at those sites. For that reason, it is not clear that the Ryegate site will be a prime option for a new economic activity.

The operations of the plant represent an additional set of economic activities for the region that will need to be repurposed, including the opportunity for alternate use of the workers from the plant. A portion of the $5 million in rate payer savings could be utilized to leverage economic development activities in the form of

[7] https://formaine.org/wp-content/uploads/2020/09/FORMaine_Report_DL_041119.pdf

grants and loans, following the same model as was executed after the closure of Vermont Yankee. The Vermont Legislature established the Windham County Economic Development Program to counter the effects of the closure of the Vermont Yankee nuclear power station. That program, initiated in 2014 has distributed $10 million for economic development activities. A 2016 Annual report provides a flavor for how the program was initiated and the types of support programs it established.[8]

[8] Report available at https://brattleborodevelopment.com/wp-content/uploads/2016/05/2016WCEDPAnnualReport-Final.pdf